Stakeholders Perspectives on time horizon and quantification of Enterprise Architectures benefits/value drivers

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Abstract

Enterprise Architectures are being used by many organizations as a strategic tool for framing and managing key business and IT initiatives and activities. However, given the complexity and costs associated with building an Enterprise Architecture, there is a growing need to demonstrate the importance and usefulness in terms of the value that it represents to an organization. Without an adequate justification for the investment in Enterprise Architecture projects, organizations either do not to start or tend to abandon their Enterprise Architectures. In this paper, we present the stakeholders perspectives on two key dimensions of the Enterprise Architectures benefits/value drivers: the time horizon (time needed for the realization of the benefits) and its quantification (measurement of the realization of the benefits). In our view, these two dimensions are fundamental to realize how much effort will be required to assess the value of an Enterprise Architecture.

Keywords: Enterprise Architecture, Benefits, Value Drivers, Time horizon

Introduction

Although it is widely recognized that the Enterprise Architectures can lead to several benefits, in many organizations there is still in the perception that investments in such projects have a weak return (Vries & Rensburg, 2008). Like any organizational initiative, it takes time, money and effort to design, implement and maintain an Enterprise Architecture. Given the substantial investment that an Enterprise Architecture represents and the current pressure to save resources and prioritize investments, it is understandable the organizations need to know if there is an effective and appropriate return from their project.

As a strategic and management function, Enterprise Architectures can help organizations to create value at different levels and in multiple domains, as they can help and complement other organizational activities, such as strategic management, organization governance or IT governance, among others. However, identifying and quantifying the direct and indirect impact of Enterprise Architectures in organizations activities is a major challenge.

During our literature review we found that the approaches for assessing the Enterprise Architectures value are still at an early stage of development, and their main concern is to identify and classify the benefits that can result from the implementation of an Enterprise Architecture (e.g., (Boucharas, Steenbergen, Jansen, & Brinkkemper, 2010; Morganwalp & Sage, 2004; Niemi, 2006). Complementarily, some authors suggest the application of financial methods for the quantification of benefits like ROI and NPV (Rico, 2006) or Applied Information Economics (Hubbard, 2004). However, the applicability of this financial methods to the assessment of the

Enterprise Architectures value is often considered inappropriate (Allega, 2005; Dyer, 2009; Raadt, Bonnet, Schouten, & Vliet, 2010; Saha, 2004).

Basically, four types of works on the Enterprise Architectures benefits/value drivers can be found in literature: (1) works that only identify lists of benefits (e.g, (Kobussen, 2009; Morganwalp & Sage, 2004; Niemi, 2006)), (2) studies that enumerate the benefits and present a classification or a set of categories for benefits (e.g., (Boucharas et al., 2010)), (3) works that present a classification or a set of categories for benefits (e.g., (Schekkerman, 2005; Schelp & Stutz, 2007)), and (4) works that seek to establish a value model that frames and contextualizes the realization of the benefits (e.g. (Kluge, Dietzsch, & Rosemann, 2006; Lange, Mendling, & Recker, 2012; Tamm, Seddon, Shanks, & Reynolds, 2011)).

In our previous work (Rodrigues & Amaral, 2013) we have identified a list of 29 key benefits/value drivers of Enterprise Architectures based in an extensive literature review and validated them with a panel of experts. These 29 benefits/value drivers are now used in this work as a basis for the study of the dimensions related to the time horizon (time needed for the realization of the benefits) and to the quantification (measurement of the realization of the benefits) of enterprise architecture benefits/value drivers. In our view, these two dimensions are fundamental to realize how much effort will be required to evaluate the value of an Enterprise Architecture. The 29 benefits/value drivers are the following:

(Improved) Alignment
(Improved) Decision Making
(Improved) Governance
(Increased) Agility
(Improved) Change Management
(Improved) Planning
(Improved) Knowledge & Understanding
(Enhanced) Enterprise Integration & Consolidation
(Reduced) Complexity
(Increased) Flexibility
(Improved) Communication
(Improved) Interoperability
(Increased) Process Improvement & Standardization
(Increased) Reuse
(Improved) Portfolio Management
(Reduced) Costs
(Improved) Risk Management
(Improved) IT Integration
(Improved) Quality
(Fostered) Innovation
(Improved) Customer Orientation
(Improved) IT Delivery
(Improved) Time to Market
(Increased) Compliance
(Increased) Management Satisfaction
(Enhanced) Assurance
(Improved) Security Management
(Enhanced) Technological Evolvability
(Facilitated) Outsourcing

Research Methodology

As mentioned in previews section, several works can be found in the literature that enumerate the Enterprise Architectures benefits. However, in these works the benefits are rarely described and characterized exhaustively.

According to our research there are no studies that address the characterization of the Enterprise Architectures benefits, namely in terms of time horizon of the benefits and their measurement/quantification. Given that the assessment of the Enterprise Architectures Value depends heavily on the time needed to realize the benefits and also on how the value resulting from this realization can be measured, we considered that it would be relevant to carry out an exploratory study based on a survey sent to a panel of experts with relevant experience in the field of Enterprise Architectures.

The purpose of this study was to ask experts to address two main questions related to the Enterprise Architectures benefits, based on their experience and knowledge.

Q1. Can a given benefit of Enterprise Architectures be realized in the short term (less than 1 year)?

Q2. Can a given benefit of Enterprise Architectures be measured in any way?

The questionnaire was sent to 62 experts, and a total of 52 valid answers were obtained, corresponding to a response rate of 83.9%. Regarding to professional background of the panel experts, 37 reported that they had an IT background (71%), 7 a Management background (13%), 4 reported a both IT and Management background (8%) and 4 indicated other areas (8%). In terms of experience in Enterprise Architecture positions/jobs, 30 experts referred that they already had experience as Enterprise Architect, 16 as Enterprise Architecture project leader/manager, 10 as senior managers and 33 as Enterprise Architecture researchers (please note that each expert could indicate experience in more than one position). It should also be noted that 38 of the 52 experts referred that they had relevant experience in Enterprise Architecture projects, having participated in more than three Enterprise Architecture projects.

Findings and Discussion

Time horizon dimension of the benefits.

The results presented in Table 1 show that most of the experts consider that most of the Enterprise Architectures benefits are realized over a period of more than one year, that is, in the long term. In fact, of the 29 benefits considered in this study, only 4 are characterized by the majority of experts as short-term benefits, more specifically the benefits *(Improved) Decision Making*, *(Improved) Governance*, *(Improved) Knowledge & Understanding* and *(Improved) Communication*. It should also be noted that the benefit *(Improved) Planning* divides exactly the opinion of the experts, obtaining the same number of answers for the short term and for the long term dimension of that benefit.

With regard to the 24 benefits which, according to the opinion of most experts, take more than one year to be achieved, two types of situations are worth highlighting: (1) there is an expressive set of benefits in which the opinion of the experts is almost unanimous, with percentages above 90% (e.g., (Improved) Security Management with 96%; or (Increased) Flexibility with 94%); and (2) there is another set of benefits in which the percentage obtained is not so significant and the percentages of responses obtained are not very expressive (e.g., *(Improved) Change Management* with 56%; *(Improved) Portfolio Management* with 60%). This reveals a lack of a broad consensus among experts regarding the characterization of benefits as being of long term.

Given the fact that none of the benefits met 100% of the responses as being as of short-term or long-term, it was considered pertinent to identify from the results a tendency in terms of time horizon and, at the same time to classify, this tendency as being strong or moderate, due to the difference of opinion among the experts to be significant or not.

In order to ensure that the identification of the time horizon tendency was supported by statistical methods, a set of statistical tests was performed on the data, more precisely binomial tests. By definition the binomial tests are proportional comparison tests, generally used to test the occurrence of one of the two achievements of a dichotomous variable, that is, to test the proportion of this occurrence in the total number of occurrences registered (Maroco, 2003). The binomial

tests allow, when the test value is less than 0.05 (p <0.05), to infer that there is a significant difference of opinion among the experts and, according to this result, to classify the tendency as being strong, that is, it is more likely that a certain benefit will be realized in that time horizon. On the other hand, when the test value is greater than or equal to 0.05 (p>=0.05), the binomial test allows to conclude that there is no significant difference of opinion among the experts and that, for that reason, the tendency is moderate, that is, less likely to occur in that time horizon.

Table 1- Results on the time horizon dimension of the benefits

Benefit ID	Benefit / Value Driver	N	Category		Observed Prop.		Binomial Test Exact Sig. (p)
			Short term	Long term	Short term	Long term	
P01	*(Improved) Alignment*	52	19	**33**	37%	**63%**	0,070
P02	*(Improved) Decision Making*	52	**33**	19	**63%**	37%	0,070
P03	*(Improved) Governance*	52	**31**	21	**60%**	40%	0,212
P04	*(Increased) Agility*	52	7	**45**	13%	**87%**	**0,000**
P05	*(Improved) Change Management*	52	23	**29**	44%	**56%**	0,488
P06	*(Improved) Planning*	52	**26**	**26**	**50%**	**50%**	1,000
P07	*(Improved) Knowledge & Understanding*	52	**28**	24	**54%**	46%	0,678
P08	*(Enhanced) Enterprise Integration & Consolidation*	52	8	**44**	15%	**85%**	**0,000**
P09	*(Reduced) Complexity*	52	4	**48**	8%	**92%**	**0,000**
P10	*(Increased) Flexibility*	52	3	**49**	6%	**94%**	**0,000**
P11	*(Improved) Communication*	52	**32**	20	**62%**	38%	0,126
P12	*(Improved) Interoperability*	52	4	**48**	8%	**92%**	**0,000**
P13	*(Increased) Process Improvement & Standardization*	52	20	**32**	38%	**62%**	0,126
P14	*(Increased) Reuse*	52	11	**41**	21%	**79%**	**0,000**
P15	*(Improved) Portfolio Management*	52	21	**31**	40%	**60%**	0,212
P16	*(Reduced) Costs*	52	7	**45**	13%	**87%**	**0,000**
P17	*(Improved) Risk Management*	52	8	**44**	15%	**85%**	**0,000**
P18	*(Improved) IT Integration*	52	12	**40**	23%	**77%**	**0,000**
P19	*(Improved) Quality*	52	8	**44**	15%	**85%**	**0,000**
P20	*(Fostered) Innovation*	52	4	**48**	8%	**92%**	**0,000**
P21	*(Improved) Customer Orientation*	52	6	**46**	12%	**88%**	**0,000**
P22	*(Improved) IT Delivery*	52	10	**42**	19%	**81%**	**0,000**
P23	*(Improved) Time to Market*	52	4	**48**	8%	**92%**	**0,000**
P24	*(Increased) Compliance*	52	10	**42**	19%	**81%**	**0,000**
P25	*(Increased) Management Satisfaction*	52	10	**42**	19%	**81%**	**0,000**
P26	*(Enhanced) Assurance*	52	6	**46**	12%	**88%**	**0,000**
P27	*(Improved) Security Management*	52	2	**50**	4%	**96%**	**0,000**
P28	*(Enhanced) Technological Evolvability*	52	4	**48**	8%	**92%**	**0,000**
P29	*(Facilitated) Outsourcing*	52	11	**41**	21%	**79%**	**0,000**

Based on the results of the binomial tests performed on the answers to the time horizon question (presented in the last column of table 1), in figure 1 is presented a simple framework for this dimension of the Enterprise Architectures benefits. As explained before, the benefits positioned in the quadrant identified by "Strong Tendency" are those that, in the binomial tests, obtained a result of less than 0.05 and that therefore present a significant difference of opinion, in turn, the benefits positioned in the quadrants identified by "Moderate Tendency " are those that obtained a test value greater than or equal to 0.05.

The characterization of the Enterprise Architectures benefits, according to the binomial tests results, shows that the benefits considered as short-term benefits, presents a moderate tendency. This suggests that it may be very difficult to realize these benefits in less than one year. This observation is especially important to understand the difficulty of assessing the value of Enterprise Architectures, since it highlights the possibility that few or none of the benefits can be effectively realized in the short term, making it difficult for the organizations that need to justify the investment in the kind of projects.

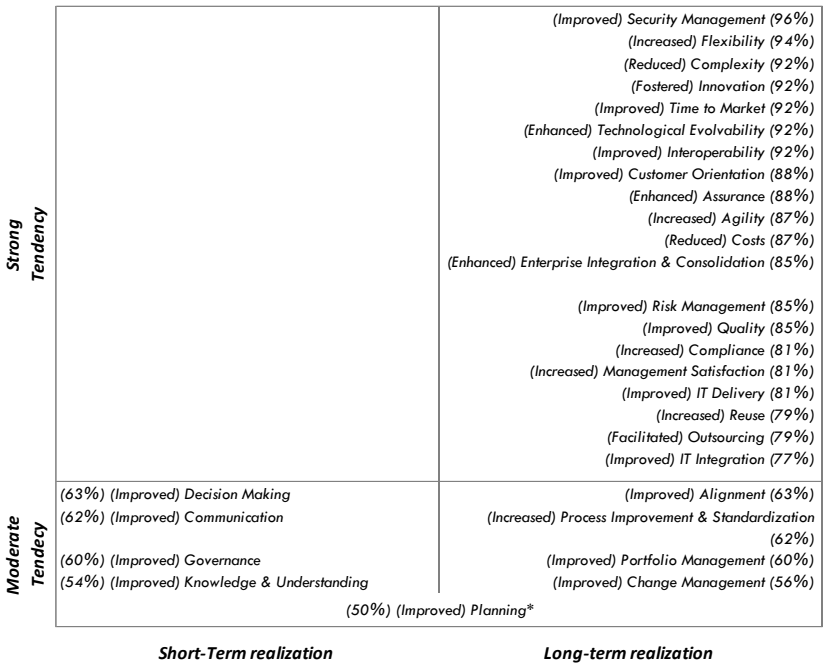


Figure 1 - Characterization in terms of time horizon of EA benefits

In addition, the results show that 20 of the 24 benefits considered by experts to be long-term benefits have a strong tendency towards the long term, which reveals that almost 2/3 of the benefits considered in this study point to that the Enterprise Architectures value can only be effectively assessed after one year.

Quantification dimension of EA benefits

As mentioned earlier, another important dimension in Enterprise Architectures value assessment is the ability of organizations to measure/quantify the realization of benefits. In this regard, we asked our panel of experts to express, based on their experience and knowledge, their opinion on whether the Enterprise Architectures benefits could be measured or not, irrespective of the type of metrics that could be used (financial or other metrics).

The results on this question, presented in table 2, show that only two benefits, *(Increased) Reuse* and *(Reduced) Costs* are considered by the majority of the experts as measurable, with percentages of 52% and 65% respectively. On the other hand, the remaining 27 value drivers are considered by most experts to be unmeasurable (with percentages between 54% and 90%).

Given the results obtained, it is possible to infer that measuring the Enterprise Architectures value can be a very difficult task to achieve, given the intangible nature that is attributed to the majority of its benefits. In this sense, it is interesting to note that the item *(Reduced) Costs*, one of the two factors considered by most experts as measurable, obtains only 65% of the experts' opinions, which is not surprising, since it is clearly a financial benefit and for that reason it is expected a wider consensus on its quantification.

Table 2 Results on quantification dimension of the EA benefits

Benefit ID	Benefit / Value Driver	N	Category		Observed Prop.		Binomial Test Exact Sig. (*p*)
			Measurable	Non-measurable	Measurable	Non-measurable	
P01	*(Improved) Alignment*	52	15	**37**	29%	**71%**	**0,003**
P02	*(Improved) Decision Making*	52	16	**36**	31%	**69%**	**0,008**
P03	*(Improved) Governance*	52	22	**30**	42%	**58%**	0,332
P04	*(Increased) Agility*	52	10	**42**	19%	**81%**	**0,000**
P05	*(Improved) Change Management*	52	10	**42**	19%	**81%**	**0,000**
P06	*(Improved) Planning*	52	16	**36**	31%	**69%**	**0,008**
P07	*(Improved) Knowledge & Understanding*	52	11	**41**	21%	**79%**	**0,000**
P08	*(Enhanced) Enterprise Integration & Consolidation*	52	20	**32**	38%	**62%**	0,126
P09	*(Reduced) Complexity*	52	13	**39**	25%	**75%**	**0,000**
P10	*(Increased) Flexibility*	52	9	**43**	17%	**83%**	**0,000**
P11	*(Improved) Communication*	52	16	**36**	31%	**69%**	**0,008**
P12	*(Improved) Interoperability*	52	19	**33**	37%	**63%**	0,070
P13	*(Increased) Process Improvement & Standardization*	52	24	**28**	46%	**54%**	0,678
P14	*(Increased) Reuse*	52	**27**	25	**52%**	48%	0,890
P15	*(Improved) Portfolio Management*	52	21	**31**	40%	**60%**	0,212
P16	*(Reduced) Costs*	52	**34**	18	**65%**	35%	**0,036**
P17	*(Improved) Risk Management*	52	9	**43**	17%	**83%**	**0,000**
P18	*(Improved) IT Integration*	52	16	**36**	31%	**69%**	**0,008**
P19	*(Improved) Quality*	52	9	**43**	17%	**83%**	**0,000**
P20	*(Fostered) Innovation*	52	5	**47**	10%	**90%**	**0,000**
P21	*(Improved) Customer Orientation*	52	8	**44**	15%	**85%**	**0,000**
P22	*(Improved) IT Delivery*	52	20	**32**	38%	**62%**	0,126
P23	*(Improved) Time to Market*	52	21	**31**	40%	**60%**	0,212
P24	*(Increased) Compliance*	52	17	**35**	33%	**67%**	**0,018**
P25	*(Increased) Management Satisfaction*	52	20	**32**	38%	**62%**	0,126
P26	*(Enhanced) Assurance*	52	9	**43**	17%	**83%**	**0,000**
P27	*(Improved) Security Management*	52	9	**43**	17%	**83%**	**0,000**
P28	*(Enhanced) Technological Evolvability*	52	5	**47**	10%	**90%**	**0,000**
P29	*(Facilitated) Outsourcing*	52	11	**41**	21%	**79%**	**0,000**

As was done for the time horizon dimension, a set of binomial tests was performed on the data about the quantification dimension, which can be found in the last column of table 2. Based on results obtained, we elaborated the framework presented in figure 2, where the benefits placed in the quadrants identified by "Strong Tendency" are those that in the binomial tests the test value a value of less than 0,05 (p<0.05) and that represent a statistically significant difference of opinion. In turn, the benefits placed in the quadrant identified by "Moderate Tendency " are those that obtained a test value greater than or equal to 0.05 (p>=0.05).

The analysis of the results of this dimension shows that *(Reduced) Costs* is the only benefit of the two considered measurable, which presents a satisfactory binomial result (p <0.05), that is, a significant difference of opinion of the specialists. However, as noted earlier, the percentage of specialists who consider it measurable is not as high as expected, which can be seen as a reflection of the difficulty in determining the extent to which cost reduction is a result of an Enterprise Architecture program.

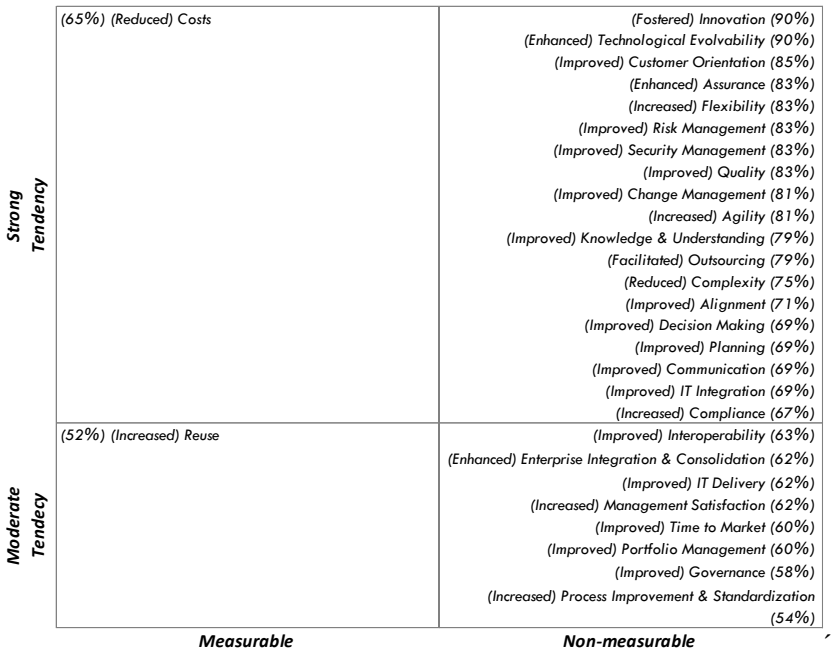


Figure 2 – Quantification dimension of the EA benefits

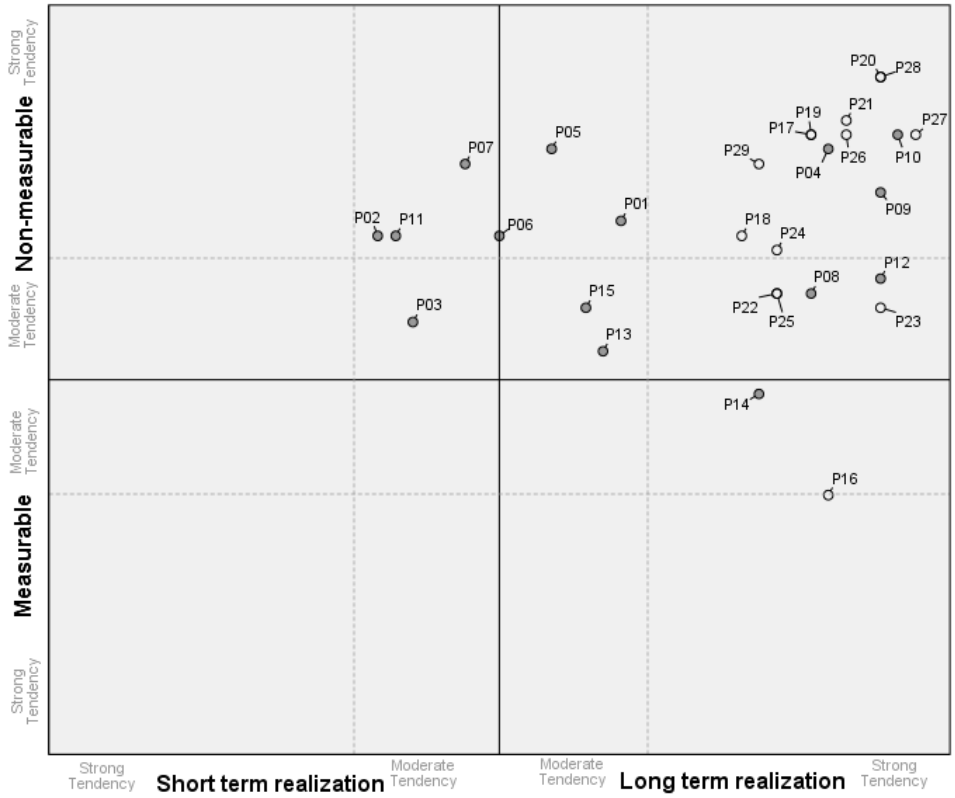
As for the 27 benefits considered as unmeasurable, the results of the binomial tests show that for 19 of them there is a statistically significant difference of opinion (p <0.05), which indicates a strong probability of being effectively intangible, or at least very difficult to measure. This reality supports and reinforces the idea that assessing the Enterprise Architectures value is a very difficult task to achieve given the difficulty in measuring or quantifying its main value drivers. However, when analyzing the answers, not in percentage terms but in absolute terms (in terms of the number of experts), it is found that for each value driver there are at least 5 experts who consider them as measurable. This fact shows that, although it is difficult, assessing the Enterprise Architectures value will not be totally impossible, considering that it is possible to exist for each of them some way of quantifying them.

Conclusion

An Enterprise Architecture project is usually a long-term project whose value to an organization increases as the results of its implementation are realized. However, the economic and financial pressures to which the organizations are currently subject oblige those responsible for the Enterprise Architectures projects to present a justification for the investment made. In this sense, it is of particular importance to identify the benefits that can be realized / achieved in a short time and that can be measured, so that they can be considered and used in organizations where it is necessary to quickly justify the Enterprise Architecture value.

After characterizing the 29 key benefits/value drivers of the Enterprise Architectures in terms of time horizon and quantification, we consider important to cross the results obtained in the two dimensions, in order to obtain a comprehensive view of the benefits characterization. The result of this crossing is presented in figure 3 which shows that most of the Enterprise Architecture benefits, 22 of the 29 (76%), are positioned in the quadrant where the dimensions are long-term and non-measurable. In addition, 13 of these 22 are in the sub-quadrant where we have a strong tendency for the two dimensions. Simultaneously, it is important to note that the two benefits

identified as to be measurable (P16 - *(Reduced) Costs* and P14 - *(Increased) Reuse*), are both characterized as long term benefits.



Note: benefit ids can be found in Tables 1 and 2
Figure 3 – Time Horizon vs. Quantification Dimensions of the EA Benefits

A third relevant fact that is observed in the figure 3 is the absence of benefits in the short-term / measurable quadrant, which means that according to the opinion of the panel of experts there is not a single benefit that can be measurable and, at the same time, be achieved in a short-term period.

In conclusion, in our view these findings help to understand why it is so difficult to assess the Enterprise Architectures value. And if it seems to be a fact that most of the benefits are achievable in the long term, their quantification although difficult will not be impossible at all. The results of this study shows that according to the opinion of some experts it is possible to measure all the benefits, although it is not possible to specify in how. As future work we intend to continue our research in order to identify and describe a set of metrics that allow measure the benefits/value drivers of Enterprise architectures.

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